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Non-Albumin Proteinuria (NAP): An Accessible, Affordable, and Easy-to-Use Biomarker for Predicting Acute Kidney Injury in Acute heart failure (NAP-HF study)

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Objectives : Identifying acute kidney injury (AKI) early in acute heart failure (AHF) patients remains challenging, many urine biomarkers are costly and inaccessible. This study focuses on non-albumin proteinuria (NAP), calculated as Urine Protein-to-Creatinine Ratio (PCR) minus Urine Albumin-to-Creatinine Ratio (ACR), to evaluate its effectiveness in predicting AKI in AHF patients.

Methods : In this prospective study, we evaluated 74 adults admitted with AHF to determine if NAP at the time of AHF diagnosis could predict AKI within 7 days. We also monitored changes in serum creatinine from baseline at day 2, day 7 and day 28. Exclusion criteria were a UPCR greater than 3, presence of pyuria or hematuria, chronic kidney disease (CKD) stage 5, or prior kidney replacement therapy.

Results : In this study of 74 AHF patients, the incidence of AKI was 14 cases (23.61%). The levels of NAP at admission were significantly higher in patients who developed AKI (0.53 vs 0.22, $p < 0.001$). Furthermore, a NAP value greater than 0.3 was significantly associated with AKI development by day 2 (57.7% vs 10.9%, $p < 0.001$), by day 7 (50% vs 2.2%, $p < 0.001$), and with acute kidney disease (AKD) by day 28 (61.5% vs 6.5%, $p < 0.001$). Univariable analysis indicated that the lack of atrial fibrillation, beta-blocker therapy, lower hemoglobin (Hb) levels, elevated blood urea nitrogen (BUN), and NAP > 0.3 were linked to AKI. Multivariate analysis identified lower Hb and NAP > 0.3 as significant predictors of AKI in AHF patients, with NAP > 0.3 showing a odds ratio (OR) of 39.5 ($p < 0.001$).

Conclusions : An increase in NAP indicative of tubular protein damage correlates with the development of AKI in patients with AHF. Consequently, NAP shows potential as an effective, affordable, and easily accessible tool for predicting AKI in the AHF patient population.

	Non-albumin proteinuria at admission		P-value
	< 0.3 g/g creatinine	≥ 0.3 g/g creatinine	
AKI at day 2 after admission, n (%)	5 (10.9)	15 (57.7)	<0.001
AKI at day 7 after admission, n (%)	1 (2.2)	13 (50)	<0.001
AKD at day 28 after admission, n (%)	3 (6.5)	16 (61.5)	<0.001

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Table 4 Multivariate analysis factor association with acute kidney injury at day 7 after admission

Variables	Univariate analysis			Multivariate analysis		
	Odd ratio	95% CI	P-value	Odd ratio	95% CI	P-value
Age	0.79	0.23-2.64	0.70			
Male	0.79	0.23-2.64	0.70			
Atrial fibrillation	0.22	0.05-1.07	0.06			
Beta-blocker	0.25	0.07-0.85	0.027	0.79	0.16-4.02	0.78
Hemoglobin	0.71	0.53-0.94	0.019	0.73	0.54-1.02	0.07
Baseline BUN, mg/dL	1.06	0.99-1.11	0.05	1.01	0.95-1.02	0.60
Pro-BNP, ng/L	1.00	0.99-1.00	0.22			
Trop-T, ng/mL	1.00	0.99-1.00	0.14			
NAP ≥ 0.3 g/gCr	45	5.37-376.9	< 0.001	39.5	4.22-370.28	< 0.001